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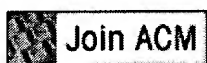
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1 Automated lip-synch and speech synthesis for character animation   ◼

J. P. Lewis, F. I. Parke
May 1986 **ACM SIGCHI Bulletin , Proceedings of the SIGCHI/GI conference on Human factors in computing systems and graphics interface**, Volume 17 Issue SI

Full text available: 📄 pdf(757.78 KB)   Additional Information: full citation, abstract, references, citings, index terms

An automated method of synchronizing facial animation to recorded speech is described. In this method, a common speech synthesis method (linear prediction) is adapted to provide simple and accurate phoneme recognition. The recognized phonemes are then associated with mouth positions to provide keyframes for computer animation of speech using a parametric model of the human face. The linear prediction software, once implemented, can also be used for speech resynthesis. The synthes ...

2 Trainable videorealistic speech animation   ◼

Tony Ezzat, Gadi Geiger, Tomaso Poggio
July 2002 **ACM Transactions on Graphics (TOG) , Proceedings of the 29th annual conference on Computer graphics and interactive techniques**, Volume 21 Issue 3

Full text available: 📄 pdf(524.89 KB)   Additional Information: full citation, abstract, references, citings, index terms

We describe how to create with machine learning techniques a generative, speech animation module. A human subject is first recorded using a videocamera as he/she utters a predetermined speech corpus. After processing the corpus automatically, a visual speech module is learned from the data that is capable of synthesizing the human subject's mouth uttering entirely novel utterances that were not recorded in the original video. The synthesized utterance is re-composited onto a background sequence ...

Keywords: facial animation, facial modeling, lip synchronization, morphing, optical flow, speech synthesis

3 Posters and Short Papers: An integrated framework for face modeling, facial motion analysis and synthesis   ◼

Pengyu Hong, Zhen Wen, Thomas Huang
October 2001 **Proceedings of the ninth ACM international conference on Multimedia**

Full text available: 📄 pdf(2.37 MB)   Additional Information: full citation, abstract, references, index terms

This paper presents an integrated framework for face modeling, facial motion analysis and

synthesis. This framework systematically addresses three closely related research issues: (1) selecting a quantitative visual representation for face modeling and face animation; (2) automatic facial motion analysis based on the same visual representation; and (3) speech to facial coarticulation modeling. The framework provides a guideline for methodically building a face modeling and animation system. The ...

Keywords: face animation, face modeling, facial motion analysis, iFACE, speech to facial coarticulation modeling

4 BEAT: the Behavior Expression Animation Toolkit

Justine Cassell, Hannes Högni Vilhjálmsson, Timothy Bickmore
August 2001 **Proceedings of the 28th annual conference on Computer graphics and interactive techniques**

Full text available: pdf(158.86 KB)   Additional Information: full citation, abstract, references, citings, index terms

The Behavior Expression Animation Toolkit (BEAT) allows animators to input typed text that they wish to be spoken by an animated human figure, and to obtain as output appropriate and synchronized nonverbal behaviors and synthesized speech in a form that can be sent to a number of different animation systems. The nonverbal behaviors are assigned on the basis of actual linguistic and contextual analysis of the typed text, relying on rules derived from extensive research into human conversationa ...

Keywords: animation systems, facial animation, gesture, speech synthesis

5 Posters & demos: Speech driven facial animation

P. Kakumanu, R. Gutierrez-Osuna, A. Esposito, R. Bryll, A. Goshtasby, O. N. Garcia
November 2001 **Proceedings of the 2001 workshop on Percetive user interfaces**

Full text available: pdf(880.00 KB)   Additional Information: full citation, abstract, references, index terms

The results reported in this article are an integral part of a larger project aimed at achieving perceptually realistic animations, including the individualized nuances, of three-dimensional human faces driven by speech. The audiovisual system that has been developed for learning the spatio-temporal relationship between speech acoustics and facial animation is described, including video and speech processing, pattern analysis, and MPEG-4 compliant facial animation for a given speaker. In particu ...

Keywords: MPEG-4, computer vision, facial animation, lip-syncing, speech processing

6 Facial animation & hair: Geometry-driven photorealistic facial expression synthesis

Qingshan Zhang, Zicheng Liu, Baining Guo, Harry Shum
July 2003 **Proceedings of the 2003 ACM SIGGRAPH/Eurographics Symposium on Computer Animation**

Full text available: pdf(62.32 MB)   Additional Information: full citation, abstract, references, citings, index terms

Expression mapping (also called performance driven animation) has been a popular method to generate facial animations. One shortcoming of this method is that it does not generate expression details such as the wrinkles due to the skin deformation. In this paper, we provide a solution to this problem. We have developed a geometry-driven facial expression synthesis system. Given the feature point positions (geometry) of a facial expression, our system automatically synthesizes the corresponding ex ...

7 Speech dialogue with facial displays: multimodal human-computer conversation

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Katashi Nagao, Akikazu Takeuchi
June 1994 **Proceedings of the 32nd conference on Association for Computational
        Linguistics**
Full text available: pdf(865.08 KB)
            Publisher Site   Additional Information: full citation, abstract, references

Human face-to-face conversation is an ideal model for human-computer dialogue. One of
the major features of face-to-face communication is its multiplicity of communication
channels that act on multiple modalities. To realize a natural multimodal dialogue, it is
necessary to study how humans perceive information and determine the information to
which humans are sensitive. A face is an independent communication channel that conveys
emotional and conversational signals, encoded as facial expression ...

8 Video Rewrite: driving visual speech with audio
Christoph Bregler, Michele Covell, Malcolm Slaney
August 1997 **Proceedings of the 24th annual conference on Computer graphics and
        interactive techniques**
Full text available: pdf(179.44 KB)   Additional Information: full citation, references, citings, index terms

Keywords: facial animation, lip sync

9 Facial animation framework for the web and mobile platforms
Igor S. Pandzic
February 2002 **Proceeding of the seventh international conference on 3D Web
        technology**
Full text available: pdf(906.61 KB)   Additional Information: full citation, abstract, references, citings, index
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Talking virtual characters are graphical simulations of real or imaginary persons capable of
human-like behavior, most importantly talking and gesturing. They may find applications on
the Internet and mobile platforms as newscasters, customer service representatives, sales
representatives, guides etc. After briefly discussing the possible applications and the
technical requirements for bringing such applications to life, we describe our approach to
enable these applications: the Facial Animation ...

Keywords: FBA, MPEG-4, VRML, facial animation, facial motion cloning, talking head,
virtual characters, virtual humans, visual text-to-speech

10 MPEG-4: an object-based multimedia coding standard supporting mobile applications
Atul Puri, Alexandros Eleftheriadis
June 1998 **Mobile Networks and Applications**, Volume 3 Issue 1
Full text available: pdf(747.80 KB)   Additional Information: full citation, abstract, references, citings, index
                                                            terms, review

The ISO MPEG committee, after successful completion of the MPEG-1 and the MPEG-2
standards is currently working on MPEG-4, the third MPEG standard. Originally, MPEG-4 was
conceived to be a standard for coding of limited complexity audio-visual scenes at very low
bit-rates; however, in July 1994, its scope was expanded to include coding of scenes as a
collection of individual audio-visual objects and enabling a range of advanced functionalities
not supported by other standards. One of the ke ...

11 Intelligent animated agents for interactive language training
Ron Cole, Tim Carmell, Pam Connors, Mike Macon, Johan Wouters, Jacques de Villiers, Alice

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Tarachow, Dominic Massaro, Michael Cohen, Jonas Beskow, Jie Yang, Uwe Meier, Alex Waibel, Pat Stone, Alice Davis, Chris Soland, George Fortier
June 1998 **ACM SIGCAPH Computers and the Physically Handicapped**, Issue 61
Full text available: ⬛ pdf(441.05 KB)   Additional Information: full citation, abstract, index terms

> This report describes a three-year project, now eight months old, to develop interactive learning tools for language training with profoundly deaf children. The tools combine four key technologies: speech recognition, developed at the Oregon Graduate Institute; speech synthesis, developed at the University of Edinburgh and modified at OGI; facial animation, developed at University of California, Santa Cruz; and face tracking and speech reading, developed at Carnegie Mellon University. These tech ...

12 Communicative facial displays as a new conversational modality   ⬛
Akikazu Takeuchi, Katashi Nagao
May 1993 **Proceedings of the SIGCHI conference on Human factors in computing systems**
Full text available: ⬛ pdf(1.03 MB)   Additional Information: full citation, abstract, references, citings, index terms

> The human face is an independent communication channel that conveys emotional and conversational signals encoded as facial displays. Facial displays can be viewed as communicative signals that help coordinate conversation. We are attempting to introduce facial displays into computer-human interaction as a new modality. This will make the interaction tighter and more efficient while lessening the cognitive load. As the first step, a speech dialogue system was selected to investigate the powe ...

Keywords: anthropomorphism, conversational interfaces, facial expression, multimodal interfaces, user interface design

13 Reception and posters: Model-based talking face synthesis for anthropomorphic   ⬛
spoken dialog agent system
Tatsuo Yotsukura, Shigeo Morishima, Satoshi Nakamura
November 2003 **Proceedings of the eleventh ACM international conference on Multimedia**
Full text available: ⬛ pdf(1.34 MB)   Additional Information: full citation, abstract, references, index terms

> Towards natural human-machine communication, interface technologies by way of speech and image information have been intensively developed. An anthropomorphic dialog agent is an ideal system, which integrates spoken dialog and natural facial expressions. This paper reports on our project aiming to create a general-purpose toolkit for building an easily customizable anthropomorphic agent. There have been almost no tools so far such as intuitive, easy to understand, fully interactive, and open sou ...

Keywords: anthropomorphic dialog agent, face image synthesis, facial animation, lip synchronization

14 Speech and gaze: A computer-animated tutor for spoken and written language learning ⬛
Dominic W. Massaro
November 2003 **Proceedings of the 5th international conference on Multimodal interfaces**
Full text available: ⬛ pdf(481.38 KB)   Additional Information: full citation, abstract, references, index terms

> Baldi, a computer-animated talking head is introduced. The quality of his visible speech has been repeatedly modified and evaluated to accurately simulate naturally talking humans. Baldi's visible speech can be appropriately aligned with either synthesized or natural

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auditory speech. Baldi has had great success in teaching vocabulary and grammar to children with language challenges and training speech distinctions to children with hearing loss and to adults learning a new language. We demonstrat ...

Keywords: facial and speech synthesis, language learning

15 Facial animation (panel): past, present and future
Demetri Terzopoulos, Barbara Mones-Hattal, Beth Hofer, Frederic Parke, Doug Sweetland, Keith Waters
August 1997 **Proceedings of the 24th annual conference on Computer graphics and interactive techniques**
Full text available: pdf(1.22 MB)   Additional Information: full citation, references, citings

16 Fuzzy input coding for an artificial neural—network modelling visual speech movements
Hans-Heinrich Bothe
February 1995 **Proceedings of the 1995 ACM symposium on Applied computing**
Full text available: pdf(406.28 KB)   Additional Information: full citation, references, index terms

Keywords: Kohonen map, certificial visual speech (AVS), fuzzy input coding, lip-reading, radical basis function network

17 Heads, faces, hair: Head shop: generating animated head models with anatomical structure
Kolja Kähler, Jörg Haber, Hitoshi Yamauchi, Hans-Peter Seidel
July 2002 **Proceedings of the 2002 ACM SIGGRAPH/Eurographics symposium on Computer animation**
Full text available: pdf(9.67 MB)   Additional Information: full citation, abstract, references, citings, index terms

We present a versatile construction and deformation method for head models with anatomical structure, suitable for real-time physics-based facial animation. The model is equipped with landmark data on skin and skull, which allows us to deform the head in anthropometrically meaningful ways. On any deformed model, the underlying muscle and bone structure is adapted as well, such that the model remains completely animatable using the same muscle contraction parameters. We employ this general techni ...

Keywords: biological modeling, deformations, facial animation, geometric modeling, morphing, physically based animation

18 An automatic lip-synchronization algorithm for synthetic faces
K. Waters, T. Levergood
October 1994 **Proceedings of the second ACM international conference on Multimedia**
Full text available: pdf(787.45 KB)   Additional Information: full citation, abstract, references, citings, index terms

This paper addresses the problem of automatically synchronizing computer-generated faces with synthetic speech. The complete process provides a novel form of face-to-face communication and the ability to create a new range of talking personable synthetic

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characters. Based on plain ASCII text input, a synthetic speech segment is generated and synchronized in real-time to a graphical display of an articulating mouth and face. The key component of the algorithm is the run-time ...

19 The virtual human as a multimodal interface

Daniel Thalmann

May 2000 **Proceedings of the working conference on Advanced visual interfaces**

Full text available: pdf(1.85 MB)   Additional Information: full citation, abstract, references, index terms

This paper discusses the main issues for creating Interactive Virtual Environments with Virtual Humans emphasizing the following aspects: creation of Virtual Humans, gestures, interaction with objects, multimodal communication.

Keywords: action recognition, gestures, multimodal communication, virtual humans

20 Performance-driven hand-drawn animation

Ian Buck, Adam Finkelstein, Charles Jacobs, Allison Klein, David H. Salesin, Joshua Seims, Richard Szeliski, Kentaro Toyama

June 2000 **Proceedings of the 1st international symposium on Non-photorealistic animation and rendering**

Full text available: pdf(1.82 MB)   Additional Information: full citation, references, citings, index terms

Keywords: animation, face tracking, image morphing, non-photorealistic rendering

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